

Inexpensive Reliable Oil-Debris Optical Sensor for Rotorcraft Health Monitoring, Phase I

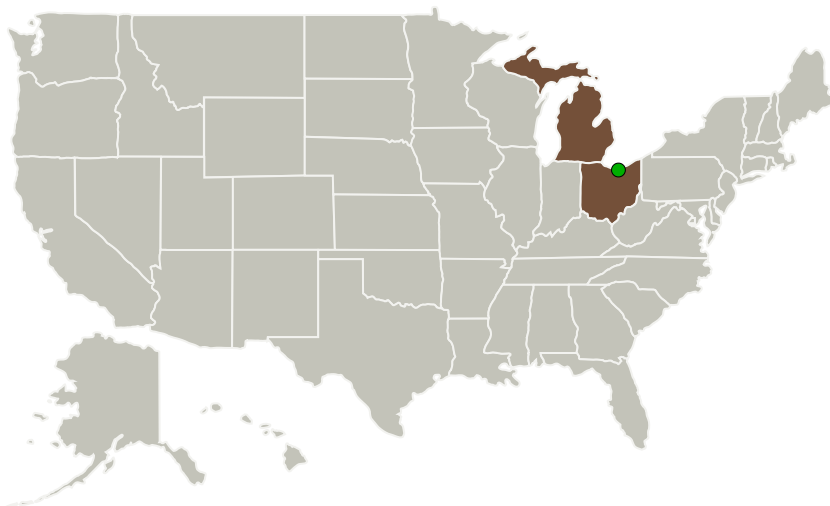
Completed Technology Project (2011 - 2011)



Project Introduction

Rotorcrafts form a unique subset of air vehicles in that a rotorcraft's propulsion system is used not only for propulsion, but it also serves as the primary source of lift and maneuvering of the vehicle. No other air vehicle relies on the propulsion system to provide these functions through a transmission system employing a single critical load path without duplication or redundancy. Thus it is critically important to monitor the drivetrain components in rotorcraft propulsion systems in order to detect the onset of damage or abnormal conditions. We propose to develop an analyzer for rotorcraft health monitoring. Our proposed device, an oil debris monitor that relies on optical means to monitor the fluid content, will provide a means to monitor the gear and bearing wear that is common in rotating machinery. This device will be based on fluid analyzers previously developed for industry. Our sensor will provide a means to detect the onset of failure using optical techniques. It will be more sensitive than electromagnetic sensors. In addition it will be able to detect all debris, metallic and non-metallic, including those generated by hybrid ceramic bearings, and will be able to do this even in the presence of air bubbles. Unlike other optical sensors, our device will be fabricated from a glass monolith and will, by its very nature, stay aligned forever, even when submitted to severe vibrations and shocks. Within the glass monolith our sensor will integrate the equivalent of two optical instruments, one optimized for large millimeter-size debris and one for smaller micron-size debris. Algorithms will be developed to merge the data provided by the two optical channels and to present a simple cohesive health assessment.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Translume, Inc.	Lead Organization	Industry	Ann Arbor, Michigan
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Michigan	Ohio

Project Transitions

February 2011: Project Start

August 2011: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138648>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Translume, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

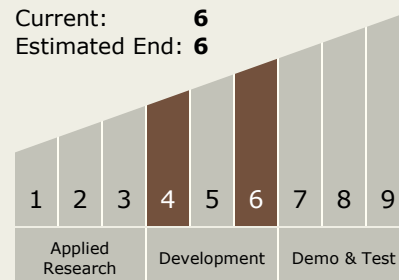
Carlos Torrez

Principal Investigator:

Thomas Haddock

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.1 Optical Communications
 - └ TX05.1.6 Optimetrics

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System